NRCS Natural Resources Conservation Service

Pasture and Hay Planting

Vermont Conservation Practice Job Sheet 512

Definition

Establishing native or introduced forage species.

Purposes

- To establish adapted and compatible species, varieties, or cultivars,
- To improve or maintain livestock nutrition and/or health,
- To extend the length of the grazing season,
- To provide emergency forage production,
- To reduce soil erosion by wind and/or water, or
- To improve water quality by reducing runoff.

Where used

This practice may be applied on lands where forage production and/or conservation is needed and feasible.

General criteria

Plant species and their cultivars shall be selected based upon:

- Climatic conditions, such as annual rainfall, seasonal rainfall patterns, growing season length, humidity levels, temperature extremes and the USDA Plant Hardiness Zones.
- Soil condition and position attributes such as pH, available water holding capacity, aspect, drainage class, inherent fertility, and flooding and ponding.
- Plant resistance to disease and insects common to the site or location.
- Plant compatibility with other forage species and their selected cultivar(s) in rate of establishment, maturity, and growth habit when seeded together as a forage mixture.

Specified seeding rates, methods of planting and date of planting shall be consistent with documented guidance cited by research institutions or agency demonstration trials for achieving satisfactory establishment such as "Cornell Recommends" or University of Vermont (UVM) Forages Home page.

Seeding rates will be calculated on a pure live seed (PLS) basis or percent germination.

Considerations

- Generally, pasture mixtures containing perennial legumes will produce higher yields and better forage quality than will pure stands of grass. Bloat is a potential hazard when legumes are included in pasture mixes.
- All seed and planting materials shall meet or exceed state quality standards. Select plants that according to federal, state, or local regulations are not considered noxious or invasive species.
- Fertilizer and soil amendment recommendations shall be based on results from a current year soil test. Application shall be appropriately placed and timed to be effective.
- Legume seed shall be inoculated with the proper species of viable Rhizobia before planting.
- If using coated seed, recalibrate the planting equipment to deliver the same number of seed per area as would be applied with non-coated seed.
- Livestock shall be excluded until the plants are well established.

Operation and maintenance

Growth of seedlings or sprigs shall be monitored for water stress. Water stress may require reducing weeds, early harvest of any companion crops, irrigating when possible, or replanting stands, depending on the severity of drought.

Invasion by undesirable plants shall be controlled by cutting, using a selective herbicide, or by grazing management by manipulating livestock stocking rates, density, and duration of stay.

Insects and diseases shall be controlled when an infestation threatens stand survival.

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Specifications

Practice specifications are prepared in accordance with the Vermont NRCS Field Office Technical Guide. Information contained in this document is considered part of the conservation plan.

Client Name:		Farm #:	
Field(s):		Tract #:	
Planned By:		Date:	
Total Acres:		Purpose:	

Purpose: Check all that apply

☐ Establish adapted and compatible species, varieties, or cultivars	☐ Extend the length of the grazing season
☐ Improve or maintain livestock nutrition and/or health	☐ Provide emergency forage production
☐ Reduce soil erosion	☐ Improve water quality by reducing runoff
☐ Other (specify):	

Field	*Acres*	*Species*	*Full Seeding Rate* (PLS lbs/ac)*	*% of Mixture*	*Actual PLS lbs/ac of Mixture*	*Planting Date:*

Total Material Needed for Job:

Planting method:

Nutrient Application Rate *Per Acre* According To Current Soil Test * :

Field No.	*Acres*	*Nitrogen (N) (lbs)*	*Phosphorus (P2O5) (lbs)*	*Potassium (K2O) (lbs)*	*Lime (ton)*	*Lab Number*

* *Fertilization will be accomplished according to current soil test recommendations.*

Notes:

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If needed, an aerial view or a side view of the practice can be shown below. Other relevant information, complementary practices and measures, and additional specifications may be included.
Recommendation: Import digital photographs to indicate practice before and after effects. For instructions regarding importing graphics to this doc go to: ftp://ftp-fc.sc.egov.usda.gov/VT/Technical/Help/Adobe_PDF_Help_1.pdf

Scale 1"=_____ ft. (NA indicates sketch not to scale: grid size=1/2" by 1/2") ↑N

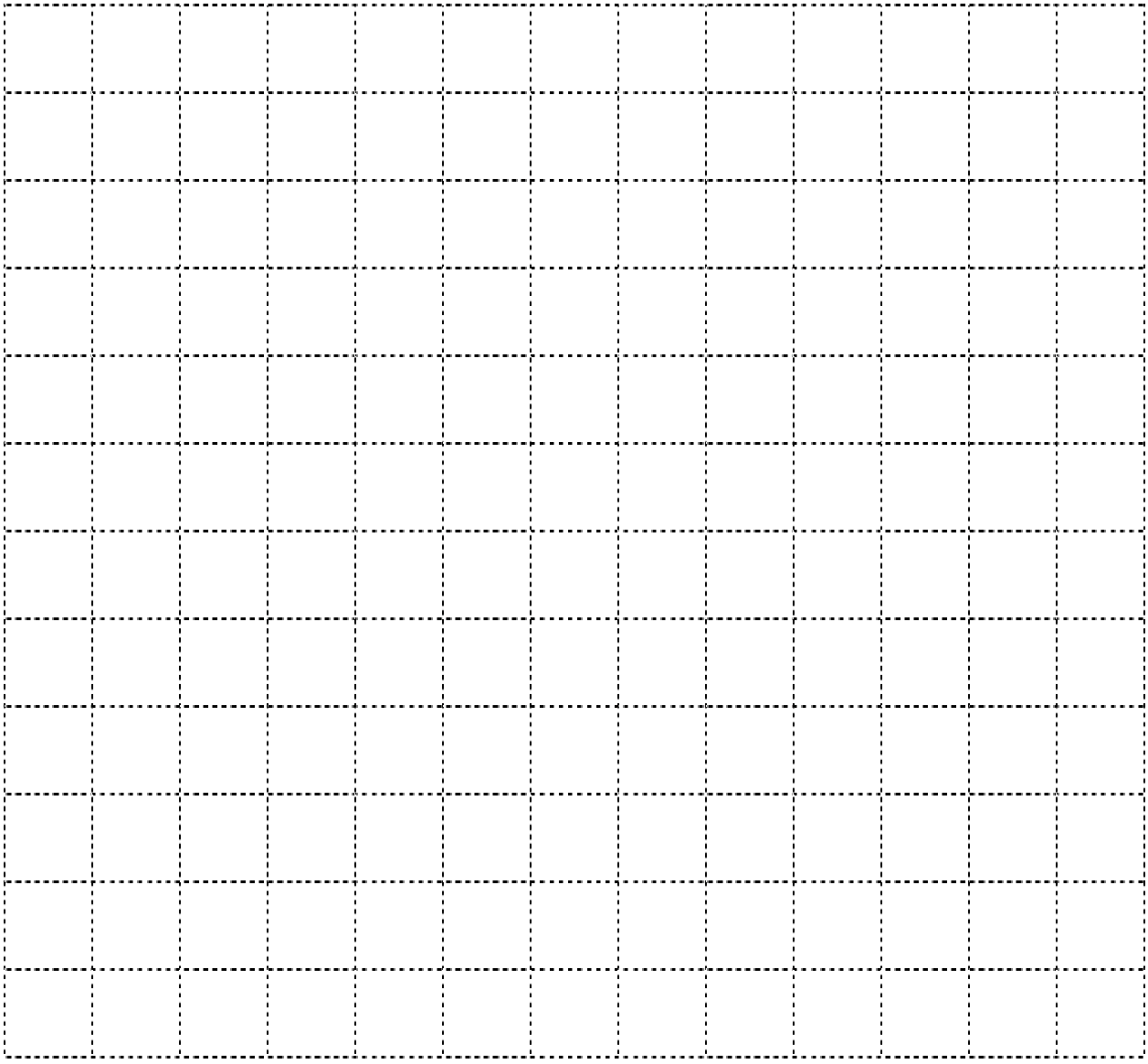

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TABLE 1
Recommended Seeding Rates for FROST Seeding Into an Existing Grass or Legume Sod ***

Species	Rate (lb./acre)		Expected Established Plants *
	Seeded Alone	As Part of Seed Mixture	Plants per Square Foot
Red Clover	6 - 12	4 - 8	2 - 5
Ladino Clover (White)	2 - 3	1 - 2	1 - 2
Alsike Clover	2 - 4	1 - 2	2 - 3
Perennial Ryegrass	6 - 10 **	4 - 6	10 - 12
Orchardgrass	3 - 4	1 - 2	4
Smooth Bromegrass		*Not recommended for frost seeding*	
Timothy	*Not recommended for frost seeding unless certain conditions or soils exist. If proper conditions exist, use the following rates:* 8 - 10	5 - 7	3 - 4
Reed Canarygrass	*Not recommended for frost seeding*		

TABLE 2
Harvest Management First Year ****

Forage	First Year Clipping/Grazing Height
Alfalfa	20 inches
Smooth Bromegrass	10 inches
Reed Canarygrass	10 inches
Red Clover	8 inches
Tall Fescue	12 inches
Orchardgrass	10 inches
Timothy	10 inches
Birdsfoot Trefoil	12 inches
Perennial Ryegrass	8 inches

* Expected plants based on "alone" seeding rates.

** Use higher rate in "bare ground" situations and lower rate in existing sods. Only in unique and rare situations should ground be bare in a January through March time period. This should only be done where there is no chance of wind erosion, water erosion, or runoff causing damage to natural resources. If crop residue cover is less than 50 percent, use the bare ground rate.

*** Frost Seeding is rarely successful in very coarse textured soils such as sands, loamy sands, or very low organic matter sandy loams.

**** Do not harvest or graze the crop until the vegetation reaches this minimum height.

TABLE 3 Crop Use Information

E = Excellent G = Good F = Fair P = Poor

Crop	Annual or Perennial	Mechanical Harvest		Pasture (Grazing)		Palatability[1]	Maturity *Early Medium Late*	Provides *Mid, Early*, or *Late* Extended Grazing
		Hay	Silage	Continuous	Prescribed			
LEGUMES								
Alfalfa	Perennial	E	E	P	E	E	E-M	M
Alsike clover	Short-lived Perennial	G	G	P	G	E	L	M
Birdsfoot trefoil *	Perennial	G	E	G	G	E	M-L	M
Hairy vetch	Winter annual used primarily as a cover crop						E-M	M
Kura clover	Perennial	G	G	E	E	E	M-L	M
Ladino clover	Perennial	F	G	E	E	E	E-L	M
Mammoth red clover	Short-lived Perennial	F	G	P	P	G	M-L	M
Medium red clover	Short-lived Perennial	G	E	P	G	E	M-L	M
Sweet clover	Biannual	F-P	G	P	F	F	N/A	N/A
GRASSES								
Kentucky bluegrass	Perennial	G	G	E	E	E	E	E & L
Orchardgrass	Perennial	E	G-E	G	E	E-F	E-M	E & M
Perennial ryegrass	Short-lived Perennial	E	E	E	G	E	E-M	L
Red top	Perennial	F	F	F	F	F		N/A
Reed canarygrass *	Perennial	E	E	G	E	G	M-L	E & L
Smooth bromegrass	Perennial	E	F	F	E	E	M-L	N/A
Tall fescue 1/	Perennial	G	G	G	G	F-P	M-L	L
Timothy	Perennial	E	E	F	G	E-G	L	N/A
ANNUAL FORAGES								
Chicory	Short-lived Perennial	P	P	G	G	G-P	E-M	E & M
Millets	Annual	F	F	F	G	G-F	M	M
Rape	Annual	P	P	F	G	G-F	M	E
SorghumXSudan	Annual	P	G	F	G	G-F	M	M
Sudangrass	Annual	P	F	F	G	G-F	M	M

1/ Palatability will improve with the newer varieties that are disease-free.

* When planting these species, in particular, but also all the species, one should use the newest disease-resistant varieties if no other plant species will meet the planting goal. Refer to Cornell Guide for Integrated Field Crop Management.

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TABLE 4 **- Seed Mixtures for Pasture and Hay Seeding Rates of Pure Live Seed Per Acre 1/**

Legume Seed (if one legume only use high rate)				**Grass Seed** (in mixes use lower rate) **3/**					
Primary Legume		**Secondary Legume**		**Orchard Grass**	**Tall Fescue 2/**	**Smooth Brome grass**	**Reed Canary grass**	**Timothy**	**Kentucky Bluegrass**
Alfalfa	8-10			4-6	6-8	4-6		2-4	
Alfalfa	12-18	(hayland only)							
Alfalfa	6-8	Red Clover	2-4	4-6	6-8	5-7		2-4	
Alfalfa	4-6	Red Clover	2	3					
Alfalfa	6-8	Ladino Clover	1/4	4-6	6-8	5-7		2-4	
Red clover	6-8			4-6	8-10	5-7		2-4	
Red clover	4-6	Ladino Clover	1/4	4-6	8-10	5-7		2-4	
Red clover	6-8				8-10				
Red clover	6-8	Alsike Clover	2	4-6	8-10	5-7	3-5	2-4	
Alsike clover	3-5	Ladino Clover	1/4	4-6	8-10	5-7	3-5	2-4	
Birdsfoot trefoil	5			2-4		4-6	6-8	2-4	2-4
Red Clover	6-10	Ladino Clover	1/2	4-6		4-6		2-4	
One Grass Only **3/**				16		10	14 **4/**		

1/ Make sure the minimum adequate drainage and area planting dates for the specific site are correct for the species chosen (Table 5). Most certified and licensed Vermont seed companies selling cool season grasses and legumes have documented > 95 percent purity and > 95 percent germination for all species sold. In these cases, use their bulk rates as equal to PLS.

2/ Endophyte free varieties.

3/ Additional grass seed species may be added to these first choices of grass seed species if determined by the conservation planner. If this is done, use the lower rate of PLS of the additional species but no lower than 50 percent. Perennial Ryegrass takes special management and should be seeded at 15-20 pounds alone or 6 to 8 pounds per acre with 2 compatible legumes.

4/ For non-drained organic soils, use appropriate varieties of Reed Canarygrass with Timothy as a quick germination forage. Only Reed Canarygrass, Tall Fescue, Smooth Bromegrass, and Timothy can take 30 days of spring flooding. New seedings shall not be grazed until at least 30 days after emergence. Birdsfoot Trefoil and Sweet Clover may spread quickly in certain soils and conditions in Vermont. Mixed stands generally have less insect and disease damage than monoculture stands.

TABLE 5 **- Crop Description, Relative Tolerance of Established Forages to Environmental Hazards, and Ease of Establishment** **E** = Excellent; **G** = Good; **F** = Fair; **P** = Poor

Crop [1]	Cold Frost	Soil Drought	Wet-ness	pH	Estab-lishment	Growth Habit	Minimum Drainage	Minimum Fertility	Anti-Quality
LEGUMES									
Alfalfa	G	G	P	6.6 - 7.2	G-E	T	WD	H	B,S
Alsike clover	F	P	G	6.0 - 6.5	F	M	PD	M	B,S
Birdsfoot trefoil	G	F	G	6.0 - 6.8	P	M-S	SPD	M	T
Hairy vetch	F	F	F	5.8 - 6.5	G	VINY	MWD	M	B
Kura clover	E	F	G	5.5 - 6.2	P	M-S	SPD	M	B
Ladino clover	F	P	G	6.0 - 6.5	G-E	S	PD	M	B,S
Mammoth red clover	P	F	F	6.2 - 6.8	G	M	SPD	M	B,S
Medium red clover	G	F	F	6.2 - 6.8	G-E	M	SPD	M	B,S
Sweet clover	G	G	P	6.8 - 7.2	F	T	MWD	M	C
GRASSES									
Kentucky bluegrass	E	P	G	5.8 - 6.5	P	S	SPD	M	
Orchardgrass	F	G	F	5.5 - 8.2	G	M-T	SPD	M	
Perennial ryegrass 2,3	P	P	G	5.0 - 8.3	E	M-S	SPD	H	
Red top	E	G	F	4.5 - 6.2	F	S	VPD	M	
Reed canarygrass 3	E	G	E	5.8 - 8.2	P	T	VPD	M	A
Smooth bromegrass	E	G	F	5.5 - 6.5	F	M-T	MWD	H	A
Tall fescue 4	F	G	G	5.4 - 6.2	G	T	SPD	M	ET
Timothy	E	F	E	5.0 - 6.2	F	M-T	PD	M	
ANNUAL FORAGES									
Annual ryegrass	P	P	G	5.6 - 6.2	E	M-S	SPD	M-H	
Chicory	F	F	F	5.0 - 8.3	G	S	MWD	H	G
Millets	P	G	P	6.2 - 6.8	G	T	MWD	M-H	
Rape/Kale	E	F	F	5.3 - 6.8	G	S	MWD	L-M	G
SorghumXSudan	P	E	P	6.0 - 6.5	E	T	MWD	M-H	CG
Sudangrass	P	E	P	6.0 - 6.5	E	T	MWD	M-H	CG

Growth Habit: **T** = Tall; **M** = Moderate; **S** = Short

Anti-Quality (components that could be present in some varieties):

A = Alkaloids (decrease palatability)
B = Bloat potential
C = Coumarin (hemorrhagic agent, formed during spoilage of hay)
CG = Cyanogenic Glycosides (may form hydrogen cyanide-HCN poisoning; also Prussic Acid Poisoning)
ET = Endophyte Toxicity (reduce blood circulation to appendages "dry gangrene")
G = Glycosides (decrease palatability)
P = Photosensitization (sunburn on animals with light color hair, reduce animal performance)
T = Tannins (decrease palatability)
S = Slaframine alkaloid (slobbers) **<>** A concern especially in the spring and summer, slobbers results when horses eat legume forages, particularly clover, which have been parasitized by the fungus Rhizoctonia leguminicola. This fungus produces an alkaloid called slaframine, which is responsible for the excessive drooling and slobbering.
<> *from Mane Points web page*

Drainage Categories (Natural Soil Drainage):

MWD = Moderately Well Drained
PD = Poorly Drained
SPD = Somewhat Poorly Drained
VPD = Very Poorly Drained
WD = Well Drained

Footnotes

1 - Select erect varieties for hay and prostate varieties for pasture.
2 - Select the more winter hardy varieties for use in Vermont
3 - Select the low-alkaloid varieties to improve palatability.
4 - Select the endophyte-free varieties to improve animal performance.

NOTES:

Primary production for legumes is spring, summer, and early fall. Primary production for cool season grasses is early spring; late fall for short grasses; and spring, early summer, and fall for tall grasses. Birdsfoot Trefoil and Sweet Clover may spread in certain soils and conditions in Vermont. Mixed stands generally have less insect and disease damage than monoculture stands.

Introduce grazing animals to brassica pastures slowly (over 3 to 4 days). Avoid abrupt changes from dry summer pastures to lush brassica pastures, such as turning hungry animals into brassicas for the first time. Brassica crops should not constitute more than 75 percent of the animal's diet. Supplement with dry hay if continually grazing brassicas or allow grazing animals to access familiar grass pastures while grazing the brassicas. For more specific forage plant information, go to the NRCS Plants database at http://plants.usda.gov/